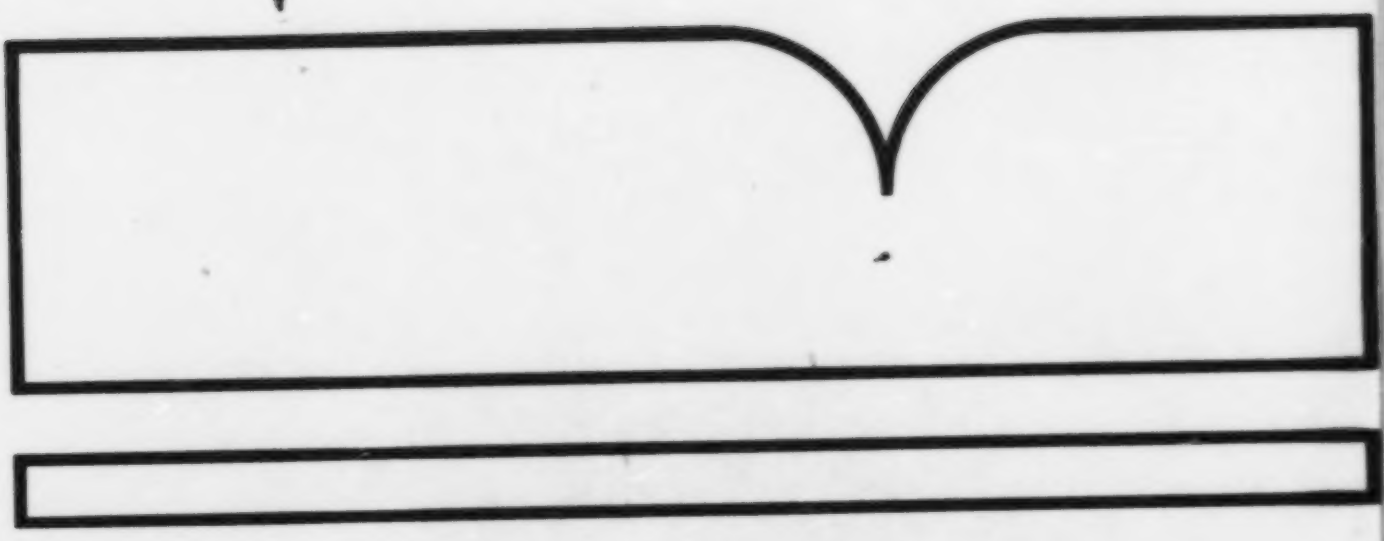
P381-136376

Emissions from Standard M-151 Jeep

(U.S.) Environmental Protection Agency
Ann Arbor, MI

Feb 70



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National Technical Information Service
NTIS.

EPA-AA-TEB 70-1

PB81-136376

Emissions from Standard M-151 Jeep

February 1970

Michael A. Caggiano
Division of Motor Vehicle Pollution Control
National Air Pollution Control Administration
Department of Health, Education, and Welfare

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TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

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16. ABSTRACT

A series of tests have been completed on a standard Army M-151 Jeep. The testing consisted of hot and cold starts as received, hot starts with a vacuum advance distributor and hot start with leaned idle A/F, Emissions were measured simultaneously by the 1970 Federal procedure and the Constant Volume Sampling (CVS) procedure. In addition, oxides of nitrogen (NOx) were measured in the CVS sample bag by the Saltzman technique.

This report presents the data collected during these tests.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
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Subject: Emissions from Standard M-151 Jeep

A series of tests have been completed on a standard Army M-151 Jeep, No. 2D4284. The testing consisted of hot and cold starts as received, hot starts with a vacuum advance distributor and hot start with leaned idle A/F. Emissions were measured simultaneously by the 1970 Federal procedure and the Constant Volume Sampling (CVS) procedure. In addition, oxides of nitrogen (NO_x) were measured in the CVS sample bag by the Saltzman technique.

A summary of the data is included in Table I.

In the "as received" condition the idle CO was 7 to 8 percent with a warm engine. By reducing the idle CO to approximately 3 percent, seven-cycle hot start hydrocarbons were reduced about 140 ppm and CO about 1 percent. The vacuum advance distributor supplied by ATAC increased both hydrocarbon and CO and caused a slight, perhaps insignificant, decrease in NO_x.

TABLE I

	CVS Procedure			1970 Federal Procedure			
	HC (FID)	CO	NO_x	HC	CO	HC	CO
	g/mile			g/mile		PPM	%
As received cold start	8.0	100.9	4.0	4.8	73.0	522	4.2
As received hot start	8.0	96.9	4.1	5.4	83.7	584	4.8
Vac. Adv. Dist. hot start	8.8	99.1	3.6	8.3	102.1	901	5.9
3% Idle CO hot start	6.1	85.9	---	4.1	61.7	440	3.6

HC	CO	CO2	FACTOR	CHC	CCO	WHC	WCO
244.7	10.38	8.51	1.04	253.8	10.77	010.7	0.45
574.0*	3.05	12.15	1.01	582.0	3.09	141.9	0.75
289.4*	2.98	12.59	1.01	291.3	3.00	034.4	0.35
3439.4*	7.62	8.01	0.93	3209.9	7.11	198.9	0.44
387.3	9.35	8.85	1.04	402.4	9.71	020.1	0.49
207.7	1.78	13.00	1.03	213.3	1.83	097.0	0.83
6025.4*	6.44	6.54	0.89	5369.1	5.74	155.6	0.17
TOTAL FOR CYCLE 1				658.3 PPM HC	3.48 CO		
433.3	9.19	9.08	1.02	443.8	9.41	018.6	0.40
958.3*	5.48	10.81	0.99	952.3	5.44	232.3	1.33
558.8*	1.67	13.60	0.96	538.5	1.61	063.5	0.19
1831.5*	7.19	8.90	1.00	1833.8	7.20	113.7	0.45
361.0	8.58	9.43	1.03	370.6	8.81	018.5	0.44
234.7	2.02	13.27	1.00	234.2	2.01	106.5	0.92
4378.9*	6.99	7.16	0.94	4126.9	6.58	119.7	0.19
TOTAL FOR CYCLE 2				672.3 PPM HC	3.91 CO		
375.6	8.49	9.47	1.03	385.5	8.71	016.2	0.37
848.8*	5.31	11.04	0.99	842.3	5.27	205.4	1.29
479.9*	2.08	13.42	0.97	464.5	2.01	054.8	0.24
1360.8*	5.49	10.16	1.01	1371.5	5.54	085.0	0.34
519.0*	7.53	10.06	1.01	522.8	7.58	026.1	0.38
425.6*	3.33	12.61	0.98	418.6	3.28	190.4	1.49
3863.3*	7.16	7.45	0.95	3683.5	6.83	106.8	0.20
TOTAL FOR CYCLE 3				684.5 PPM HC	4.29 CO		
325.3	7.86	9.92	1.02	331.9	8.02	013.9	0.34
703.3*	5.28	11.13	1.00	701.5	5.26	171.1	1.28
224.1	2.48	13.24	0.98	220.6	2.44	026.0	0.29
1547.3*	6.90	9.16	1.01	1569.8	7.00	097.3	0.43
299.8	7.08	10.38	1.02	305.1	7.21	015.3	0.36
221.8	2.79	12.99	0.99	219.8	2.77	100.0	1.26
3175.8*	6.87	7.71	0.99	3157.1	6.84	091.5	0.20
TOTAL FOR CYCLE 4				514.8 PPM HC	4.16 CO		
316.8	7.76	9.92	1.02	324.4	7.94	013.6	0.33
610.5*	5.26	11.13	1.01	614.0	5.29	149.8	1.29
232.8	3.41	12.63	0.99	231.3	3.38	027.3	0.40
1120.0*	6.77	9.57	1.02	1145.9	6.92	071.0	0.43
297.3	6.63	10.55	1.02	303.8	6.78	015.2	0.34
218.9	2.81	12.93	0.99	217.7	2.80	099.0	1.27
3195.3*	6.66	7.72	1.00	3193.3	6.65	092.6	0.19
TOTAL FOR CYCLE 6				468.1 PPM HC	4.25 CO		
292.4	7.52	10.09	1.02	299.1	7.69	012.6	0.32
537.5*	5.38	11.09	1.01	542.8	5.43	132.4	1.33
237.9	3.18	12.77	0.99	235.9	3.15	027.8	0.37
1309.5*	6.53	9.14	1.05	1373.0	6.85	085.1	0.42
255.2	6.53	10.63	1.02	260.9	6.67	013.0	0.33
211.9	3.22	12.67	1.00	211.8	3.21	096.3	1.46
3172.8*	6.77	7.68	1.00	3173.8	6.77	092.0	0.20
TOTAL FOR CYCLE 7				459.0 PPM HC	4.43 CO		
AVE 1-4 632.3PPM HC		3.96CO		AVE 6-7 463.5PPM HC		4.34 CO	
TRIP COMPOSITE				522.3 PPM HC	4.21 CO		
HC MASS =	4.82	CO MASS =	72.97				

5-0030 11-06-69 ARMY JEEP 2D4284 13557 MILES 3000#
1962 EXPERIMENTAL STANDARD TRANS. (Test #100 -CVS)

HC	CO	CO2	FACTOR	CHC	CCO	WHC	WCO
447.6	9.67	8.81	1.02	458.9	9.91	019.3	0.42
614.3*	4.24	11.66	1.00	616.3	4.25	150.3	1.04
260.5	2.74	12.93	0.99	258.9	2.72	030.6	0.32
5000.0*	5.08	7.28	0.95	4759.8	4.84	294.9	0.30
359.5	9.75	8.67	1.04	373.9	10.14	018.7	0.51
249.8	2.48	12.87	1.01	251.7	2.50	114.5	1.14
6511.6*	6.53	6.08	0.88	5759.8	5.78	166.9	0.17
TOTAL FOR CYCLE 1				795.0 PPM HC	3.89 CO		
546.5	9.87	8.50	1.03	564.5	10.20	023.7	0.43
970.3*	5.93	10.49	1.00	969.5	5.92	236.6	1.44
374.3	2.70	12.91	0.99	369.8	2.67	043.6	0.32
2133.8*	7.46	8.23	1.02	2167.9	7.58	134.3	0.47
417.6	8.62	9.30	1.03	430.4	8.88	021.5	0.44
300.9	2.71	12.82	1.00	300.6	2.71	136.8	1.23
3888.5*	7.47	6.75	0.99	3839.8	7.38	111.3	0.21
TOTAL FOR CYCLE 2				707.5 PPM HC	4.54 CO		
488.9	10.06	8.40	1.04	507.3	10.45	021.3	0.44
707.3*	6.65	10.16	1.02	718.8	6.75	175.3	1.65
299.1	3.09	12.68	1.00	298.0	3.08	035.2	0.36
1535.5*	7.30	8.54	1.05	1605.3	7.63	099.5	0.47
346.1	8.00	9.68	1.03	356.8	8.25	017.8	0.41
263.1	3.17	12.59	1.00	263.6	3.18	119.9	1.44
3760.5*	7.11	6.96	0.99	3739.3	7.07	108.4	0.20
TOTAL FOR CYCLE 3				577.0 PPM HC	4.98 CO		
397.5	8.89	9.11	1.04	411.8	9.21	017.3	0.39
869.3*	6.56	10.09	1.01	880.3	6.64	214.7	1.62
273.9	2.87	12.84	0.99	272.5	2.85	032.1	0.34
1699.5*	7.10	8.77	1.02	1739.5	7.26	107.8	0.45
321.5	7.51	10.00	1.03	330.4	7.72	016.5	0.39
241.6	3.55	12.38	1.00	242.8	3.57	110.5	1.62
4468.8*	7.35	6.77	0.95	4240.1	6.97	123.0	0.20
TOTAL FOR CYCLE 4				621.5 PPM HC	5.00 CO		
370.9	8.89	9.16	1.03	383.6	9.19	016.1	0.39
699.3*	5.53	10.86	1.01	705.0	5.57	171.9	1.36
273.0	3.65	12.35	1.00	273.5	3.66	032.3	0.43
1558.5*	7.47	8.65	1.03	1605.8	7.69	099.5	0.48
292.9	7.22	10.14	1.03	301.5	7.44	015.1	0.37
235.8	3.58	12.36	1.01	237.2	3.60	107.9	1.64
3797.8*	7.31	6.99	0.98	3733.3	7.18	108.3	0.21
TOTAL FOR CYCLE 6				550.8 PPM HC	4.87 CO		
333.1	8.71	9.29	1.03	344.6	9.02	014.5	0.38
610.8	6.21	10.34	1.03	627.3	6.38	153.0	1.56
271.5	4.04	12.12	1.00	272.5	4.06	032.1	0.48
1250.9*	6.53	9.21	1.05	1310.0	6.85	081.2	0.42
551.0*	7.19	10.15	1.01	556.8	7.26	027.8	0.36
229.2	3.52	12.38	1.01	230.8	3.55	105.0	1.61
3779.3*	7.24	6.95	0.99	3737.3	7.16	108.3	0.21
TOTAL FOR CYCLE 7				521.5 PPM HC	5.02 CO		

AVE 1-4 675.0PPM HC 4.60CO AVE 6-7 536.0PPM HC 4.94 CO

TRIP COMPOSITE 584.5 PPM HC 4.82 CO

HC MASS = 5.40 CO MASS = 83.66

5-0031 11-06-69 ARMY JEEP 2D4284 13567MILES 3000#

1962 EXPERIMENTAL HOT START STANDARD TRANS. (Test 101-CVS)

HC	CO	CO2	FACTOR	CHC	CCO	WHC	WCO
1511.6*	6.78	9.55	0.99	1502.9	6.74	063.1	0.28
809.3*	6.01	10.61	1.00	809.8	6.01	197.6	1.47
364.4	3.89	12.27	0.99	361.5	3.86	042.6	0.46
3073.1*	6.46	7.96	1.00	3069.3	6.45	190.2	0.40
482.6	7.69	9.92	1.01	489.4	7.80	024.5	0.39
423.1	4.99	11.53	1.00	423.5	4.99	192.7	2.27
5287.0*	6.56	6.69	0.92	4886.5	6.06	141.6	0.18
TOTAL FOR CYCLE 1			851.8 PPM HC		5.44 CO		
1522.8*	8.52	8.61	1.00	1520.8	8.50	063.9	0.36
921.8*	6.16	10.60	0.99	910.3	6.08	222.0	1.48
566.8*	4.50	11.90	0.98	556.5	4.42	065.6	0.52
2480.4*	6.24	8.56	1.01	2504.9	6.30	155.2	0.39
438.0	8.29	9.47	1.03	450.1	8.52	022.5	0.43
358.5	5.18	11.43	1.01	360.8	5.21	164.1	2.37
5080.0*	6.93	6.40	0.94	4798.8	6.54	139.1	0.19
TOTAL FOR CYCLE 2			832.3 PPM HC		5.73 CO		
1657.5*	8.18	8.54	1.00	1665.5	8.22	069.9	0.35
1447.3*	6.42	10.34	0.96	1388.1	6.16	338.5	1.50
772.8*	5.08	11.45	0.98	755.8	4.96	089.1	0.59
1237.8*	6.36	8.83	1.09	1343.8	6.90	083.3	0.43
462.9	8.77	9.11	1.03	478.9	9.07	023.9	0.45
353.5	5.14	11.45	1.01	355.6	5.17	161.8	2.35
4091.8*	6.86	6.65	1.00	4091.8	6.86	118.7	0.20
TOTAL FOR CYCLE 3			884.8 PPM HC		5.86 CO		
1442.8*	8.33	8.77	1.00	1442.8	8.33	060.6	0.35
1205.0*	6.52	10.32	0.97	1173.8	6.35	286.3	1.55
721.3*	5.40	11.23	0.98	710.5	5.32	083.8	0.63
1022.9*	5.76	9.55	1.07	1095.1	6.17	067.9	0.38
485.4	8.33	9.41	1.03	498.6	8.55	024.9	0.43
349.3	4.58	11.74	1.01	351.3	4.61	159.8	2.10
4134.8*	6.66	6.61	1.01	4160.1	6.70	120.7	0.19
TOTAL FOR CYCLE 4			803.3 PPM HC		5.62 CO		
1470.6*	8.21	8.75	1.00	1475.5	8.23	062.0	0.35
1180.1*	7.00	9.84	0.99	1169.9	6.94	285.3	1.69
721.3*	5.02	11.48	0.98	707.8	4.93	083.5	0.58
1301.8*	6.39	8.60	1.10	1429.1	7.02	088.6	0.44
438.5	8.76	9.12	1.04	454.8	9.08	022.7	0.45
359.4	5.62	11.09	1.01	364.3	5.70	165.7	2.59
3731.3*	6.32	6.89	1.03	3842.8	6.51	111.4	0.19
TOTAL FOR CYCLE 6			818.8 PPM HC		6.29 CO		
1757.3*	8.20	8.40	1.01	1769.5	8.25	074.3	0.35
1395.0*	6.69	10.14	0.97	1349.0	6.46	329.0	1.58
634.5*	5.15	11.41	0.99	626.5	5.09	073.9	0.60
2181.6*	6.94	8.32	1.02	2234.4	7.11	138.4	0.44
793.0*	8.14	9.48	1.01	797.8	8.19	039.9	0.41
576.8*	4.79	11.61	0.99	571.5	4.75	259.9	2.16
4783.0*	6.91	6.44	0.96	4603.5	6.65	133.4	0.19
TOTAL FOR CYCLE 7			1048.8 PPM HC		5.72 CO		
AVE 1-4 842.8PPM HC		5.66CO		AVE 6-7 933.8PPM HC		6.01	CO
TRIP COMPOSITE			901.3 PPM HC		5.88 CO		
HC MASS =	8.32	CO MASS =	102.13				

5-0039 11-12-69 FORD ARMY JEEP #2D4284 13589 MILES #3000
EXP. W/NEW DIST . 4 SPEED TRANS. HOT START (102)

HC	CO	CO2	FACTOR	CHC	CCO	WHC	WCO
207.9	2.61	13.21	0.98	204.3	2.56	008.6	0.11
356.0	3.52	12.39	1.00	354.9	3.51	086.6	0.86
248.2	4.57	12.04	0.99	246.4	4.54	029.1	0.54
1386.1*	4.41	10.49	1.02	1415.0	4.50	087.7	0.28
283.5	7.64	10.15	1.01	287.8	7.76	014.4	0.39
194.8	1.92	13.46	0.99	193.0	1.90	087.8	0.87
4144.5*	4.26	8.51	0.96	3972.5	4.08	115.2	0.12
TOTAL FOR CYCLE 1			429.1 PPM HC		3.15 CO		
248.7	2.85	13.19	0.97	242.3	2.77	010.2	0.12
371.1	4.35	12.07	0.99	367.3	4.31	089.6	1.05
282.0	5.48	11.47	1.00	281.5	5.47	033.2	0.65
1478.5*	3.64	10.84	1.02	1502.4	3.70	093.1	0.23
257.3	6.88	10.65	1.01	259.5	6.94	013.0	0.35
218.6	3.38	12.71	0.99	216.4	3.34	098.5	1.52
3477.5*	4.16	8.95	0.98	3409.1	4.07	098.8	0.12
TOTAL FOR CYCLE 2			436.1 PPM HC		4.03 CO		
284.5	2.04	13.46	0.98	278.8	2.00	011.7	0.08
352.1	4.24	12.14	0.99	348.6	4.20	085.0	1.02
253.4	5.40	11.54	1.00	253.0	5.39	029.9	0.64
1696.3*	3.10	10.82	1.02	1730.8	3.17	107.3	0.20
216.8	6.22	11.06	1.01	218.2	6.26	010.9	0.31
1							
76.2	2.52	13.20	0.99	174.3	2.50	079.3	1.14
4062.5*	3.69	8.66	0.97	3953.0	3.59	114.6	0.10
TOTAL FOR CYCLE 3			438.5 PPM HC		3.49 CO		
219.8	1.91	13.50	0.99	216.8	1.88	009.1	0.08
283.6	4.07	12.24	0.99	281.9	4.04	068.8	0.99
234.2	4.60	12.04	0.99	232.7	4.57	027.4	0.54
1683.5*	3.13	10.63	1.03	1740.5	3.23	107.9	0.20
204.6	5.74	11.36	1.00	205.2	5.76	010.3	0.29
184.9	2.99	12.95	0.99	183.0	2.95	083.3	1.34
3715.8*	3.41	8.88	0.99	3687.5	3.39	106.9	0.10
TOTAL FOR CYCLE 4			413.4 PPM HC		3.53 CO		
436.6	1.39	13.29	1.00	437.6	1.40	018.4	0.06
425.4	4.12	12.09	0.99	421.9	4.09	102.9	1.00
234.6	4.63	12.04	0.99	232.8	4.59	027.5	0.54
1923.8*	2.60	10.45	1.05	2015.6	2.73	125.0	0.17
226.1	6.44	10.92	1.01	227.6	6.49	011.4	0.32
181.1	3.03	13.00	0.98	178.4	2.98	081.1	1.36
3775.3*	3.45	8.72	1.00	3767.5	3.44	109.2	0.10
TOTAL FOR CYCLE 6			475.3 PPM HC		3.54 CO		
390.6	1.35	13.55	0.99	386.4	1.33	016.2	0.06
365.5	4.39	11.96	1.00	364.0	4.37	088.8	1.07
255.8	6.42	10.88	1.01	258.0	6.47	030.4	0.76
1428.1*	3.15	10.73	1.05	1493.6	3.29	092.6	0.20
202.2	5.58	11.47	1.00	202.3	5.58	010.1	0.28
164.9	2.50	13.25	0.99	162.9	2.47	074.1	1.12
3585.8*	3.10	9.00	1.00	3600.5	3.12	104.4	0.09
TOTAL FOR CYCLE 7			416.4 PPM HC		3.58 CO		

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VE 1-4 429.1PPM HC 3.55CO AVE 6-7 445.9PPM HC 3.56 CO

TRIP COMPOSITE 439.8 PPM HC 3.56 CO

HC MASS = 4.06 CO MASS = 61.70

S-0048 12-03-69 FORD ARMY JEEP #2D4284 13636 MILES 3000#

EXP. CARB RESET 4 SPEED

Std Mechanical Advance Distributor